CLAIMS

What is claimed is:

1. A bolt comprising a shank and at least one of a head and a nut and having a first shape, wherein the bolt is configured to change from the first shape to a second shape upon applying heat thereto and wherein said bolt is configured to remain in said second shape even after the bolt has been cooled.

2. The bolt as described in claim 1, wherein the bolt is made of a shape memory alloy.

3. The bolt as described in claim 1, further including a cavity and wherein said cavity is configured to store chemicals, which when reacted, emit heat sufficient to change the bolt from the first shape to the second shape.

4. The bolt as describe in claim 1, further including an axial retainer and a threaded collar, wherein the bolt is engaged with the threaded collar.

5. The bolt as described in claim 2, further including a cavity and wherein said cavity is configured to store chemicals, which when reacted, emit heat sufficient to change the bolt from the first shape to the second shape.

6. The bolt as describe in claim 2, further including an axial retainer and a threaded collar, wherein the bolt is engaged with the threaded collar.

7. The bolt as described in claim 2, wherein the shape memory alloy includes nickel-titanium; titanium-palladium-nickel; iron-zinc-copper-aluminum; titanium-niobium-aluminum; titanium-niobium; copper-aluminum-nickel; uranium-niobium; copper-zinc-aluminum; nickel-titanium-copper; iron-manganese-silicon; Fe-8Cr-5Ni-20Mn-5Si; hafnium-titanium-nickel; nickel-iron-zinc-aluminum; copper-aluminum-iron; nickel-zirconium-titanium; and zirconium-copper-zinc.

8. The bolt as described in claim 4, wherein the cavity contains chemicals with exothermic reactions that, when ignite, generate heat sufficient to induce phase transformations to the bolt.

9. The bolt as described in claim 5, wherein the threaded collar is configured to change from a first shape to a second shape upon application of heat.

10. The bolt as described in claim 6, wherein the threaded collar is configured to change from a first shape to a second shape upon application of heat.

11. A method for torquing a first object to a second object using a self-torquing bolt, said method comprising the steps:

providing a bolt made from a shape memory alloy;
tightening the bolt to at least one of a tapped hole and a nut; and
applying heat to the bolt to thereby change the bolt from a first shape to a second shape.

12. The method of claim 11, wherein the bolt comprises a cavity for storing heating generating materials.

13. The method of claim 11, wherein the bolt is positioned inside a threaded collar.

14. The method of claim 11, wherein a unit to be torqued includes a deep hole with tapped threads along the upper periphery near one of a head or a nut.

15. The method of claim 11, wherein the heat applied to the bolt is generated by igniting heat generating materials.

16. The bolt as described in claim 2, further including a threaded retainer and an intermediate collar.

17. The bolt as described in claim 2, further comprising a conical end and wherein the bolt is disposed within an outer retainer and said retainer comprises at least two slits.

18. The bolt as described in claim 2, further comprising a thread portion and wherein the thread portion is configured to change from a first shape to a second shape when activated by a sufficient heat source and wherein the thread portion remains in said second shape even after it has cooled.

19. The bolt as described in claim 2, further comprising a shank portion and wherein the shank portion is configured to contract in shape when activated by a sufficient heat source and remains in said contracted shape even after it has cooled.

20. The bolt as described in claim 1, wherein the heat is generated from a heat source comprising a chemical compound that has an exothermic reaction when reacted and wherein heat generated by the exothermic reaction is sufficient to change the bolt from the first shape to the second shape.

21. A method for torquing a first object to a second object by utilizing a self-torquing fastener assembly comprising:

placing the first object directly or indirectly adjacent to the second object, wherein the first object and the second object each comprises an opening in axial alignment with one another and wherein the indirect configuration comprises a third object positioned adjacent either the first object or the second object;

securing the fastener assembly to the first object and the second object by inserting a straight portion of the fastener assembly in the opening of the first and second objects, wherein the fastener assembly comprises a first compressive stress value, an inner fastener and an outer fastener, and the inner and outer fasteners each comprises a shape memory alloy;

heating the fastener assembly such that the fastener assembly changes from a first phase to a second phase when heated and in changing to the second phase changes to a second compressive stress value; and transferring the second compressive stress value to the first and second objects to apply a compressive force to the first and second objects to compress the first object with the second object.

22. The method of claim 21, wherein the fastener assembly comprises an inner fastener assembly coaxially disposed with an outer fastener assembly.

23. The method of claim 21, wherein the outer fastener assembly comprises an exterior threaded portion.

24. The method of claim 21, wherein the outer fastener assembly comprises a slit and wherein the slit spreads from a first gap to a second gap when the fastener assembly is heated and changes to the second phase.

25. The method of claim 23, wherein the opening of the first object or the second object comprises a threaded section and the exterior threaded portion of the outer fastener assembly is threaded to the threaded section of the opening.